

## Compatibility Determination

**Use:** Mosquito Monitoring and Control

**Refuge Name:** Franz Lake National Wildlife Refuge (Refuge), located near Skamania, Skamania County, Washington, as part of the Ridgefield National Wildlife Refuge Complex.

**Establishing and Acquisition Authority(ies):**

Fish and Wildlife Act of 1956 (16 U.S.C. 742)

**Refuge Purpose(s):** "...for the development, advancement, management, conservation and protection of fish and wildlife resources..." 16 U.S.C. 742(a)(4)  
"...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant or condition of servitude..." 16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956).

"...suitable for – (1) incidental fish and wildlife –oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species..." 16 U.S.C. 460k-1 "...the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors..." 16 U.S.C. 460k-2 (Refuge Recreation Act (16 U.S.C. 460k-460k-4), as amended).

Although the refuge purposes are the first and highest obligations, management for trust resources of the U.S. Fish and Wildlife Service (Service), when appropriate, can be added to the achievement of refuge purposes and become a management priority for the national wildlife refuge. Service legislation mandates establishes migratory birds, inter-jurisdiction fish, and federally listed species (threatened and endangered) as trust resources of the Service. In addition, Section 4(a)(4)(B) of the National Wildlife Refuge System (Refuge System) Improvement Act of 1997, states, "In administering the System, the Secretary shall...ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans..." This legislative mandate represents an additional directive to be followed while achieving refuge purposes and the Refuge System's mission.

**National Wildlife Refuge System Mission:** The mission of the Refuge System is “...to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans (National Wildlife Refuge System Administration Act of 1966, as amended [16 U.S.C. 668dd-668ee]).

## **Description of Uses:**

### **Introduction**

In 2002, the Skamania County (Washington) Mosquito Control Board (Control Board) proposed a program to monitor and control mosquito populations on the Franz Lake Refuge (Figure 1). A Compatibility Determination (CD) was signed on October 22, 2002 (U.S. Fish and Wildlife Service 2002), which authorized the Control Board to monitor and control mosquito populations in an area east of a dike located at the east end of the lake with *Bacillus thuringiensis israelensis* (*B.t.i.*). It also authorized mosquito control for human health and/or fish or wildlife threat caused by mosquito-vectored pathogens such as western equine encephalitis, St. Louis encephalitis, West Nile virus, etc. Both of these actions were to be accomplished with a set of Refuge-issued stipulations identified in the CD.

The 2002 CD also identified a lack of detailed information regarding the use of Franz Lake in areas west of the dike by fish species, especially listed salmonids. As of August 26, 2002, a number of Evolutionary Significant Units (ESUs) of steelhead and Chinook salmon in the Columbia River basin were listed under the Federal Endangered Species Act as threatened. Coho salmon in the Columbia River basin ESU were added to the list as threatened on August 29, 2005. The CD also identified a lack of information about the effects of mosquito control treatments on non-target invertebrate species in Franz Lake. This lack of information prevented the Refuge staff from determining if control efforts west of the dike located at the east end of the lake were compatible with Refuge purposes.

Due to the high-profile nature of this issue, the U.S. Fish and Wildlife Service (Service) agreed to fund two research projects. The first study focused primarily on assessing the fisheries resources throughout the Refuge. This study included monthly sampling of fish species within various aquatic habitat types, monitoring of water surface elevations, and monitoring water quality. This study was conducted by the Service's Columbia River Fisheries Program Office from August 2003 through September 2005.

The second study examined the direct and indirect impacts of mosquito-control treatments (*B.t.i.*) on mosquito and non-target invertebrate species that represent potential forage for wildlife and fish (including the listed salmonids). This study was conducted during the 2003 mosquito breeding season by the Washington Cooperative Fish and Wildlife Research Unit (Tamayo et al. 2005).

This CD describes the results and application of those studies to assess the following proposed actions.

#### Proposal for Monitoring and Controlling of Nuisance Mosquitoes

Within an area west of the Franz Lake dike, the Control Board staff proposes to monitor and control mosquito larvae with *B.t.i.* when established thresholds are exceeded as indicated through monitoring. Monitoring and larval treatments will be restricted to shallowly flooded (<8 inches) vegetation (primarily reed canarygrass) that represent mosquito breeding habitat. Three possible mosquito monitoring and control areas are proposed depending upon water levels. The total maximum acreage to be monitored under various conditions is approximately 26 acres (5 percent) of the 550-acre Refuge.

*B.t.i.* is a selective microbial insecticide targeting mosquito larvae; however, studies during the mid-1990s in the Midwest (Hershey et al. 1998) had found that other Dipteran species (flies) can also be impacted, including chironomids, an important fish and wildlife food source. *B.t.i.* produce protein endo-toxins that, when ingested by the susceptible insect, cause paralysis of cells in the gut, interfering with normal digestion and feeding. As proposed, *B.t.i.* may be applied (10 pounds/acre) as often as once per two to three weeks depending on larval mosquito populations. The bacteria are grown on high-protein bases (fishmeal, soy flour), which are then formulated onto corn cob pellets enabling it to be broadcast over the treatment area by a hand-held or all-terrain vehicle-mounted spreader.

The current protocol for southwest Washington mosquito control districts when monitoring wetlands for mosquito larvae is to treat with the larvicide *B.t.i.* when the larvae reach established threshold levels. The current treatment threshold used by the Clark County Mosquito Control District is five mosquito larvae per dip net sample. Clark County Mosquito District personnel stated that most of the other mosquito control districts use 1 larva per dip (including Multnomah County), but Clark County personnel require a higher threshold before treatment is conducted. On other refuges around the country, threshold levels used by mosquito control districts range from 1 to 15 larvae per dip with an average of five (M. Higgins 2002, Pers. Comm.).

Control Board staff have been using the 5 larvae per dip threshold for treating the areas east of the Franz Lake dike, and it would use the same threshold for the areas west of the dike.

Mosquito larvae numbers within Franz Lake could be affected by a number of factors such as weather conditions, precipitation, and time of year. The primary factor contributing to the production of the mosquitoes, however, is the degree of water fluctuation in Franz and Arthur Lakes and along their shorelines, where mosquitoes lay their eggs and subsequently hatch. Although there is some fluctuation due to precipitation, tidal influences, and floodwaters, the primary source of fluctuating water levels in the Franz Lake basin is the result of changes in water releases from Bonneville Dam, which is located approximately 10 miles upstream. Due to the uncertainty of the water releases and Columbia River water fluctuations, and subsequent mosquito hatches, the total amount of larvicide to be used, and the times, dates, and exact locations of application (magnitude and frequency) cannot be predicted. In some cases, certain

areas would need repeated treatments.

The following three areas (Figures 2 and 3) would be monitored and treated, if necessary, for mosquito populations (larvae) depending upon Columbia River water levels.

1. When water levels in the Columbia River are below 20-foot Mean Sea Level (MSL), an area of approximately 10 acres of canarygrass at the east end of Franz Lake between the open water area and the Franz Lake dike (Figure 2).
2. Below 20-foot MSL (Figure 2), a narrow 10-20 foot band of mixed wetland vegetation is present along the south shoreline of the lake, just below an approximate 4-foot bench south of the shoreline. The top of this bench, at approximately 20 feet above MSL, gradually rises to a ridge of 30-foot MSL which parallels the Columbia River shoreline approximately 600 to 800 feet south of the Franz Lake shoreline, which equals approximately 1 acre of habitat.
3. Above 20-foot MSL (Figure 3), areas between the bench 4-feet above the lake shoreline and the adjacent ridge between the Columbia River and the lake as described above could be covered by the shallow water. These areas would follow the contours of the various elevations between 20 and 30 feet, depending upon the Bonneville Dam water releases. Although most of these contours generally parallel the Franz Lake shoreline, there is an approximately 1-foot deep, 15-acre elongated depression which would be flooded should Columbia River waters exceed 20-foot MSL.

The U.S. Army Corps of Engineers is responsible for regulating flows from the Bonneville Dam, located approximately 10 miles upstream of Franz Lake. The releases are made for a variety of reasons, including upstream river levels, electrical power generation, and salmonid migration in the Columbia River. These releases result in irregular fluctuations in the water levels of the Columbia River and Franz Lake, which is hydrologically connected to the Columbia River via Arthur Lake. Examination of the Bonneville releases (U.S. Army Corps of Engineers 2006) over the past 15 years indicates a wide fluctuation of the elevations from year to year, and within the proposed application period. Skamania County Mosquito Board staff (Williams 2006) has indicated that under these conditions, mosquito monitoring and treatment activities would be restricted to the leading edge of the shallow water and any shallow water-filled depressions. This leading edge is defined as 10-20 foot wide band covering approximately the same 1 acre of area, with an additional estimated maximum 15 acres of depressions which could hold water as the leading edge receded.

The area between the south shore of Franz Lake and the ridge along the Columbia River has a ground cover of reed canarygrass, with evenly scattered mature willow and red-osier dogwood trees along the slope leading to the ridge. Black cottonwoods and Oregon ash are the predominant overstory vegetation along the ridge. Observations by refuge staff during the

summer months have not indicated large numbers of wildlife using the ground surface in the areas that would be monitored and treated, especially if flooding indicated such a requirement for mosquito control. Migratory landbirds such as yellowthroat and willow flycatchers use the trees and shrubs in the area, along with a diverse community of native wildlife such as black-tailed deer, coyote, raccoon, and mink.

Monitoring by Control Board staff would be conducted on a weekly basis between April 1 and September 30, and each monitoring visit would generally take an hour (Williams 2006). If mosquito larvae dip numbers reached threshold levels, Control Board staff would request approval from the Refuge manager to apply *B.t.i.* Board staff estimates that *B.t.i.* treatment of areas described above would generally take 3-4 hours, and it would be done as soon as possible after threshold levels are exceeded.

#### Proposal for Adult Mosquito Monitoring for Disease Presence

The Control Board also proposes to conduct adult mosquito monitoring in the vicinity of Franz Lake. The monitoring would consist of setting out up to four standard traps for capturing adult mosquitoes, each consisting of a carbon dioxide mosquito attractant (dry ice) and small collection container. Adult mosquitoes would be trapped at up to four locations on the Refuge (Figure 4). Trapping will provide information about mosquito populations (species and relative abundance) and a source for disease surveillance samples to be sent to the Washington State Department of Health, Olympia, Washington, for testing for mosquito-borne pathogens such as Western and St. Louis encephalitis and West Nile Virus. This information would be valuable in determining appropriate actions to take should a human health and/or wildlife threat be identified by the appropriate public health agency. A compatibility determination for mosquito control for human health and/or fish or wildlife threat caused by mosquito-vectored pathogens was approved in the 2002 compatibility determination for mosquito control, monitoring, and research.

**Why this Use is being Proposed:** On wetland habitats of the Franz Lake Refuge, annual Columbia River high water flows flood much of the bottomlands surrounding Franz Lake and the adjacent Arthur Lake. This water permeates the ground cover of non-native reed canary grass, which provides vegetative debris as egg-laying sites for two major species of floodwater mosquitoes, *Aedes vexans* and *Ochlerotatus sticticus*, when high-water levels recede. When water returns during subsequent flooding, the eggs hatch, larvae grow rapidly, and adults feed for two weeks or more until they breed, lay eggs, and then die. The current water elevation fluctuations, caused by natural flood conditions and the operation of the Bonneville Dam by the U.S. Army Corps of Engineers upstream of the refuge, may provide optimum conditions for multiple hatches of mosquitoes in a single summer on Franz Lake Refuge.

Some residents living near the lake shore have indicated that, historically, summer mosquito populations were frequently high in the vicinity of Franz Lake. During years of mosquito outbreaks in Skamania, Washington, local residents attributed the large number of mosquitoes to Franz Lake. They have stated the mosquitoes hatched in the Franz Lake area would fly up the

Indian Mary Creek drainage toward the town of Skamania and neighboring residences. The Control Board responded by fogging areas suspected of producing mosquitoes, including what is now the Franz Lake Refuge, using an unknown adulticide. When the Refuge was acquired in 1990, the District had been inactive since 1979 (Holm 2002, pers. comm.; Price 2002, pers. comm.).

It appears that cattle grazing in the bottomlands surrounding Franz and Arthur Lakes occurred to varying degrees between 1979 and Refuge acquisition in 1990. It was grazed heavily during the early to mid-1980s. When the Refuge was purchased in 1990, the area was being grazed only lightly (4-5 cows) resulting in heavy reed canarygrass cover. From 1990-1992, no grazing was allowed on the Refuge with no mosquito problems reported. The Refuge re-initiated grazing on an experimental basis to provide short grass for wintering Canada geese for two years, but discontinued this use in 1996 because it was degrading the quality of wetland and adjacent riparian habitats. The elimination of cattle grazing resulted in heavy reed canarygrass growth and detritus on the Refuge. The interactions among river fluctuations, timing and efficacy of grazing, and mosquito breeding dynamics were never investigated. Co-incidental with cattle removal, the Columbia River experienced extremely high flooding in 1996 and extended periods of flooding in 1997. Frequent fluctuations and high water conditions are considered a prerequisite for multiple mosquito hatches and subsequent outbreaks of mosquito species. During 1999, high mosquito populations prompted numerous complaints of nuisance mosquitoes to Refuge staff, news media, and local legislative staff. Residents expressed concerns about the nuisance caused by the mosquitoes, as well as the potential for the transmission of mosquito-borne diseases such as West Nile Virus, St. Louis encephalitis, and western equine encephalitis.

In 1999, the Skamania County Commissioner of District 1 learned that the Clark County (WA) Mosquito Control District was applying *B.t.i.* at the Ridgefield NWR for the control of mosquito larvae and requested that *B.t.i.* treatments also be permitted on Franz Lake Refuge. The Ridgefield NWR continues to allow *B.t.i.* treatment of mosquitoes based on monitoring data associated with larval thresholds and application history. Treatments are restricted to core floodplain mosquito production areas, as identified by the Clark County Mosquito Control District. This control program will also be evaluated in the future under compatibility guidelines, current policy, and data gathered during the Comprehensive Conservation Planning (CCP) process. The primary difference between the two refuges is the confirmed year-round presence of listed salmonid species in certain areas of Franz Lake. Franz Lake is a migratory pathway and smolt rearing site for listed salmonids, whereas, the importance of Ridgefield NWR for listed salmonids is currently unknown.

A CD for integrated pest management at Franz Lake Refuge was issued in 1999, based on initial research into the effects of *B.t.i.* on non-target invertebrates. A literature search at that time revealed that its effects were relatively specific, affecting mosquitoes, crane flies, blackflies, and non-biting midges (Chironomids). For this reason, *B.t.i.* was considered a considerably better choice for mosquito control than adulticides, which may impact other invertebrates, fish, and wildlife. During 1999, applications of *B.t.i.* for mosquitoes was permitted because of limited adverse effects to non-target species. Refuge Special Use Permits were issued for mosquito monitoring and control with *B.t.i.* during 1999, 2000, and 2001. Areas authorized for monitoring and treatment were shallow wetland areas of Franz Lake, approximately 2 percent of the 550-acre Refuge.

Alpine Pest Management Specialists (subcontracted by Clark County Mosquito Control District for 1999 and 2000) conducted monitoring and control activities on approximately 10 acres in the eastern-most section of the Franz Lake that contained reed canarygrass and shallow water. In 2000, they extended their treatment area to the south edge of the shoreline which added approximately 1 acre. Treatment in this area was outside the scope of their SUP due to the presence of a bald eagle nest and suspected salmonid use of Franz and Arthur Lakes. After the issuance of the 1999 Compatibility Determination, Refuge staff had expressed concerns about the lack of information documenting whether the mosquitoes using Franz Lake NWR are the mosquitoes found in the nearby community of Skamania, or if they are produced in residential backyards and nearby heavily vegetated lands. Therefore, between 2000 and 2002, Service and refuge staff worked with personnel from three local mosquito control districts (Multnomah County, Oregon; Columbia County, Oregon; and Clark County, Washington) to conduct coordinated mosquito control activities, especially aerial spraying. Refuge personnel initially met with this group in January 2000 to share concerns about nuisance complaints and mosquito-borne diseases; Service responsibilities for wildlife, fish, and public health; and to develop strategies and identify responsibilities for upcoming years. The Control Board was formed in Skamania County in 2001 and is currently working with the Refuge staff.

During 2000, Refuge staff obtained scientific literature indicating the potential adverse effects of *B.t.i.* on several non-target aquatic invertebrates. In addition, they learned of the anticipated listing under the Endangered Species Act of two additional salmonid fish species that seasonally use Franz Lake Refuge, lower Columbia River Chinook in 1998 and steelhead in 1999. Based on that information, the Service was concerned that exposure of *B.t.i.* to non-target aquatic invertebrate species could reduce the food resources for several salmonid fish species. As stated earlier, research was initiated to learn more about *B.t.i.* effects on non-target invertebrates and to determine utilization of Franz Lake by fish. The findings of these studies are summarized in the Wildlife and Wetland, and Fisheries Impacts from Mosquito Monitoring and Treatment sections.

There have been 31 documented human cases state-wide of western equine and St. Louis encephalitis (with no deaths) between 1950 and 2000. None of these reported cases were in Clark or Skamania Counties (Grendon 2000). Although West Nile virus was first documented in the eastern states, it has been moving west since that time. In the state of Washington, birds and horses have been confirmed with West Nile Virus (Duffy 2006, pers. comm.) During 2002, a common raven from Pend Oreille County was reported, as well as one American crow from

Thurston, Snohomish, and Pierce Counties, and two horses, one from Island County and one from Whatcom County. During 2005, a magpie and two horses were reported from Yakima County. During 2003 and 2004, no cases of West Nile Virus were reported in Washington State. There have been no documented human cases of mosquito borne-infection in Washington State. Moreover, less than 1 percent of humans who are exposed and infected with West Nile virus become seriously ill. The fatality rate of those who do develop serious illness is 3 to 15 percent. Most human infections of West Nile virus are asymptomatic or characterized by mild flu-like symptoms. The elderly and persons with compromised immune systems are more likely to develop severe illness (Ashe 2002).

**Availability of Resources:** Ideally, Refuge staff would accompany mosquito control district personnel whenever they came onto the refuge to ensure their compliance with the stipulations presented herein and the terms and conditions of the SUP issued for monitoring and treatment activities. It is anticipated that up to one-half day for monitoring and up to a full day or more is needed for one Refuge staff member every week or two when Control Board personnel schedule a visit. This would be difficult to achieve considering the disruptions in the regular work schedule, inability to schedule meetings, etc. Because the Refuge has a single employee, the Service would be unable to oversee all mosquito monitoring and control actions. Since 2002, the Refuge staff has provided oversight for mosquito monitoring and control activities conducted by the Control Board, authorized by their annual SUP. The Control Board staff has been cooperative and compliant with the SUP stipulations. Therefore, it is believed that the proposed additional mosquito management actions could be coordinated with existing Refuge staff and resources.

Additionally, Refuge staff would also be available to provide oversight and coordination for mosquito monitoring and control by the districts in the event of a public health threat or emergency associated with mosquito-borne diseases.

#### **Anticipated Impacts of the Use(s):**

##### **Wildlife and Wetland Impacts Anticipated from Mosquito Monitoring and Treatment**

###### **Research on Franz Lake Invertebrate Communities (Tamayo et al. 2005)**

During July through August 2003, research staff from the Washington Cooperative Fish and Wildlife Research Unit, University of Washington, Seattle, gathered invertebrate samples to assess the short-term effects of *B.t.i.* on the invertebrate communities along the southern shoreline of Franz Lake. Four 43-yard long x 6.5-yard wide treatment and control plots were alternately established perpendicular to the shoreline, separated by 55-yard buffers. A ground application of *B.t.i.* (Vectobac-G) with a gasoline powered blower at a rate of 6.9 pounds/acre (label rate range – 2.5 – 20 pounds/acre) was used to control mosquitoes in the treatment plots when mosquito larvae numbers were found to have reached the threshold level of 5 larvae per dip. This represents operational monitoring and control activities that would be conducted by the Control Board staff. Bti was applied to each treatment plot three times at 9-10 day intervals. Lake bottom (benthic)



and water column samples were collected from each plot 1 to 2 days prior and 7 days after each *B.t.i.* treatment to assess changes in the invertebrate community before and after treatments. A total of 512 invertebrate samples were collected where numbers and species were identified to family and genus.

Prior to *B.t.i.* treatment, the southern shoreline of the lake exhibited a fairly diverse community of over 40 taxa, with about half of the taxa consisting of insect families. Individuals of Oligochaeta (worms) and Cyclopoida (Crustacea) were the most abundant taxa, making up almost 55 percent of all individuals. Diptera (flies) and Coleoptera (beetles) were the most abundant insects. It was found that the macroinvertebrate community did not vary dramatically along the shoreline.

After *B.t.i.* was applied, no significant differences were detected among the control and treatment plots. This was similar to the results found in Charbonneau et al. (1994). Neither study found significant differences in the invertebrate communities after treatments.

## **Fisheries Impacts from Mosquito Control**

### Background

Limited seasonal surveys conducted during the 1990s by the Columbia River Fisheries Program Office of the Service indicated that some areas of the waters and wetlands of Franz Lake Refuge provided habitat for cutthroat trout, steelhead, and Chinook and coho salmon. All of these species except cutthroat trout are currently listed as threatened under the Endangered Species Act.

Coho salmon, steelhead, and Chinook salmon were thought to spawn in tributaries near the refuge, whereas cutthroat trout may spawn in tributary streams on the refuge. Chum salmon are thought to spawn in the Columbia River near the outlet of Franz Lake. These species, except chum salmon, were believed to rear in Franz and Arthur Lakes, although spatial use patterns during the summer rearing season were not documented. Therefore, there was a concern regarding the potential negative indirect effects of *B.t.i.* on salmonids in Franz and Arthur Lakes. Research conducted in Minnesota regarding *B.t.i.* treatments for mosquitoes found adverse affects on chironomids (Hershey et al. 1998), which had been shown to be one of the most important food items for juvenile Chinook salmon throughout the Columbia River. Based on the uncertainties of use, distribution and diets of salmonids in Franz Lake, and specifically the areas proposed for *B.t.i.* treatment, the Service conducted a two-year study (2003-2005) of these issues relative to Franz Lake.

### Research on Franz Lake Fisheries Populations (USFWS Unpublished Data)

The fish population study was designed to determine the composition and distribution of fish species inhabiting the Franz Lake Refuge on a monthly basis, and describe diets of juvenile salmonids. Areas selected to conduct monthly fish surveys included the channel near the confluence with the Columbia River (mouth), immediately upstream and downstream of a beaver dam in the channel leading from Poacher Springs to Franz Lake (Poacher Springs), the channel downstream from the outlet of Franz Lake (channel), Franz Lake at the confluence with Indian Mary Creek (IMC), along the north shore of Franz Lake (north shore), and along the south shore

of Franz Lake (south shore). The six areas were surveyed using overnight sets of baited minnow traps (4 each at the mouth, Poacher Springs, and IMC, and 8 each at the north shore and south shore) and a hoop net (channel and IMC) once per month from September 2003 through September 2005. After removing traps during April-June 2004 and March-June 2005, a single pass with an electrofishing boat was made at IMC, channel, north shore, and south shore, as well as through the center of Franz Lake parallel to the shores, once per month. Stomach contents of salmonids were collected using gastric lavage.

Preliminary results indicate that a total of 21 fish taxa were collected of which 9 were native, including 4 salmonid species, and 12 were introduced. Of the 2,357 individuals collected overall, slightly over 5 percent were salmonids (Table 1) - Chinook salmon (21), coho salmon (78), cutthroat trout (15), and rainbow-steelhead (7)). At least one individual salmonid was collected at each area surveyed with the exception of the center of Franz Lake, which was only sampled by electrofishing during spring months of both years. Among the six areas surveyed, most salmonids were collected at the mouth, and the two areas directly associated with tributaries, Indian Mary Creek and Poacher Springs. The majority of Chinook salmon and coho salmon were typically collected at most areas during the months outside of the April-September period proposed for *Bti* applications (Table 1).

Table 1. Number of salmonids by species collected at each survey area at Franz Lake Refuge during September 2003 through September 2005 (numbers collected during April through September in all years). All individuals were juveniles except cutthroat trout.

Survey Area	Species			
	Chinook Salmon	Coho Salmon	Cutthroat Trout	Rainbow-Steelhead
Mouth	6 (1)	23 (8)		4 (3)
Poacher Springs	5 (1)	22 (13)		
Channel		1 (0)		
Indian Mary Creek	1 (0)	21 (17)	15 (12)	2 (2)
North shore	4 (1)	8 (2)		1 (1)
South shore	5 (1)	3 (1)		
Total	21 (4)	78 (41)	15 (12)	7 (6)

Diets were described for few juvenile salmonids because most fish had empty stomachs. This was likely due to fish not feeding, and perhaps regurgitating, while caught in traps. Gastric lavage was also not attempted on fish if they appeared stressed regardless of collection method. However, in May 2005, stomachs were dissected from seven juvenile coho salmon mortalities that were obtained by electrofishing at Indian Mary Creek. The dominant food item, by number, in all seven fish was zooplankton (33-377 individuals per fish, primarily Cladocera), which represented 98.3 percent of all items. Larval Chironomidae occurred in five fish (3-12 individuals per fish), representing 1.6 percent of the diet. The remaining food items consisted primarily of fragments

of terrestrial insects (e.g., Hymenoptera), and Ceratopogonidae, Plecoptera, and Nematoda. A small amount of material was obtained by gastric lavage from five coho salmon captured by minnow traps at Poacher Springs in May 2005. All fish contained terrestrial organisms (e.g., Araneae, Collembola, adult Trichoptera and Diptera; 1-6 individuals per fish), representing 64.7 percent of all items, whereas remaining items were single individuals (i.e., larval Chironomidae, Ephemoptera, Nematoda, Diptera pupae, Copepoda, and Amphipoda). Mosquito larvae were not found in any of the dietary samples.

#### *Anticipated short-term effects of the use*

The Service does not anticipate any short-term effects of the proposed use directly on non-target invertebrates or indirectly to fish. Tamayo et al. (2005) did not observe significant negative effects of *B.t.i* applications on the invertebrate community at the south shoreline of Franz Lake. Application of *B.t.i* for the study followed protocols identified by the Control Board for the proposed use and was conducted at the same location during periods of water elevations lower than 20 feet MSL.

Four species of juvenile salmonids, three of which are presently protected under the Endangered Species Act (steelhead, coho salmon and Chinook salmon), and cutthroat trout, occurred at various areas of Franz Lake including the south shore for Chinook and coho salmon.. The relative numbers of salmonids collected among the areas using consistent sampling effort over the two-year period indicate that the south shore likely is not preferred habitat, especially during the months that the proposed use would occur. Moreover, the limited diet information collected at Franz Lake in May 2005 suggests that juvenile coho salmon were not predominantly feeding on invertebrate taxa found to be sensitive to *B.t.i* application.

As presented in the Description of Uses, there is a 4-foot bench at 20 foot MSL paralleling the southern Franz Lake shoreline. This slopes generally upward to the south to a 30-foot ridge approximately 400 feet south of the shoreline. During the timeframe when the invertebrate and salmonid research investigations were conducted, Columbia River water elevations as measured by Bonneville Dam tailwater elevations did not exceed 20 foot MSL. Because of this, there was no opportunity to study invertebrate and salmonid use of this higher elevation when it is flooded. During periods when Columbia River water levels are above 20 foot MSL (Figure 3), a larger area would be covered by the shallow water. These areas would follow the contours of the various elevations between 20 foot and 30 foot, depending upon the Bonneville Dam water releases. Although most of these contours generally parallel the Franz Lake shoreline, there is an approximately 1-foot deep, 15-acre elongated depression which would be flooded should Columbia River waters exceed 20 feet. Examination of the Bonneville water releases (U.S. Army Corps of Engineers 2006) over the past 15 years indicates a wide fluctuation of river elevations between and within years during the proposed application period. Because the areas which would be flooded during the mosquito season would be expected to vary greatly from week to week and from year to year, it is unlikely that repeated *B.t.i* applications would occur within the same areas during the mosquito treatment season and between years.

The impacts anticipated from the logistical activities resulting from the proposed monitoring and

treatment actions on wildlife would be minimal. A single Control Board employee using an all-terrain vehicle (ATV), would conduct these activities ~~and~~ restricted to refuge service roads and a minimum of trails. By using an all-terrain vehicle to access the area, it would reduce the number of trips needed on foot for monitoring and treatment, thereby, minimizing disturbance to wildlife. Speed limit would be restricted to 5 miles per hour. Monitoring activities would usually occur once a week, and take approximately 1 hour. Subsequent treatments, if necessary, would occur as soon as possible after monitoring activities and take an estimated 4 hours (Williams 2006). These activities would cause short-term and temporary disturbance to wildlife. In the event of an identified public health threat or emergency (e.g., West Nile Virus) by the Washington State Public Health Agency, the data from these monitoring efforts would be invaluable to the Refuge for determining an appropriate course of action. The 2002 Mosquito Control, Monitoring, and Research CD addressed mosquito control for human health and/or fish or wildlife threats caused by mosquito-vectorated pathogens.

Consequently, the Service believes that the proposed monitoring and subsequent applications of *B.t.i.* would not have substantial short-term impacts on fish and wildlife.

#### *Anticipated long-term effects of the use*

The Service does not anticipate long-term impacts of the proposed use. Hershey et. al. (1998) conducted a six-year study on 27 wetlands in Wright County, Minnesota, consisting of three years of pre-treatment sampling of aquatic invertebrates and other parameters, followed by three years of treatment with *B.t.i.*. Insect densities and diversity were reduced by 57 to 83 percent in the second and third years of treatment. During this study, 179 genera of aquatic insects were examined, with chironomids (primarily midges) representing about half of the insect genera present at the beginning of the study. By the end of the study, however, only one to six genera dominated the treatment sites. Adverse impacts were primarily observed in the invertebrate tribes Chironomini and Tantarsini. These tribes are ubiquitous and are represented in almost every wetland with chironomids. Although Hershey et al. (1998) found negative effects of *B.t.i.* on non-target invertebrates; this study is not applicable in the case of Franz Lake for the following reasons:

1. Entire wetlands were treated with *B.t.i.* multiple times within and over several consecutive years in the Minnesota study. In contrast, the proposed maximum number of acres to be treated at Franz Lake is very small (26 acres represents only 5 percent of the total 550 acres of the Refuge). This would be the worst case scenario, when the Columbia River flooded all of the proposed monitoring and treatment areas. When water levels are below 20 foot MSL, approximately 11 acres (3 percent of the total Refuge area) would be monitored and treated.
2. In addition to the small area to be treated, the above study was conducted in a closed system, where there was no opportunity for an influx of additional invertebrates and insects. Franz Lake is connected to Arthur Lake to its west, and then the Columbia River, providing a significant opportunity for recharging Franz Lake wetlands with additional invertebrates during seasonal water elevation fluctuations of the Columbia

River and Franz Lake waters..

3. Monitoring records along the southern shoreline of Franz Lake by the Control Board staff over the past three years indicated that the areas to be treated would change from week to week as mosquito larvae did not reach threshold levels in the same places each week. Because of fluctuating water levels changing the location of the shallow flooded shoreline, it is unlikely *B.t.i.* applications would occur in the same areas repeatedly over time. In addition, stipulations in the special use permit will limit the number of applications in a specific location during one season.

#### *Anticipated cumulative effects of use*

On a refuge scale, the recently completed invertebrate and salmonid research along the south Franz Lake shoreline has provided valuable information regarding the cumulative impacts of mosquito treatment and control measures in the area ~~to~~ proposed to be treated. The invertebrate study was conducted during the latter part of the application period (July – September) when lower Columbia River elevations eliminate the flows from the river through Arthur Lake to Franz Lake, representing minimal opportunity for an influx of new invertebrate communities. Furthermore, during the single treatment season of this study, stable water levels during July-September resulted in three applications of *B.t.i.* to the same locations. This represents a worse case treatment scenario, because it is unlikely that the same areas will be retreated, considering the dynamic nature of the shoreline during the mosquito season (early and late spring) when river levels fluctuate dramatically. Consequently, it is unlikely there will be negative cumulative direct impact on the invertebrate community or indirectly on fish and wildlife.

During the two years of monitoring fish resources, a total of 2,357 individuals were collected in the six sampling locations. Of those, a total of 121 salmon were collected, with only 2, one Chinook salmon and one coho salmon, being collected in the area proposed to be treated during the treatment period (April through September). Because there were no impacts to non-target invertebrates from *B.t.i.* treatment, it is unlikely that other native fish would be impacted from applications.

Although mosquito larva were reduced from *B.t.i.* treatments, there were no significant differences in the over 40 taxa of invertebrates, with 50 percent of the taxa represented by other insects, which had been represented at shallow water sites where treatments would occur prior to treatment. Based on the results of the invertebrate survey, it would be expected that alternative prey would be available for native fishes (including salmonids), as well as other wildlife, that depend on larval or adult mosquitoes as forage.

On a regional scale, mosquito treatment occurs in many Columbia River floodplain habitats in Skamania, Clark and Cowlitz Counties in Washington, as well as Clackamas and Multnomah and Columbia Counties in Oregon. These floodplain habitats are the prime foraging/rearing sites available for potentially far-ranging species such as salmonid smolts and fry as they make their way to the ocean. The number of potential salmonid rearing sites along the lower Columbia River that are treated by the various mosquito control agencies has not been compiled. Data on

out-migration of salmonids and wetland use by rearing smolts should be obtained to address the potential cumulative impacts on listed salmonids.

### **Wildlife and Fisheries Impacts from Adult Monitoring for Disease Presence**

The impacts anticipated from the proposed adult monitoring for disease presence activities would be temporary and localized and should be similar to those described under Wildlife and Wetland Impacts Anticipated from Mosquito Monitoring and Treatment. Foot traffic would be minimized; a Mosquito Control Board employee would use a pickup or all-terrain vehicle to get close to these traps and then walk to them. Vehicular access would be restricted to refuge service roads and a minimum number of trails with a maximum speed limit of 5 miles per hour; and the number of adult mosquitoes captured in the carbon dioxide traps would not be large enough to adversely impact any species or habitat. These activities would likely pose only minor, short-term localized disturbances.

In the event a situation arises that could adversely affect public safety, the data from these monitoring efforts would be invaluable to the refuge for determining an appropriate course of action. The 2002 Mosquito Control, Monitoring and Research CD addressed mosquito control for human health and/or fish or wildlife threat caused by mosquito-vectored pathogens.

### **Impacts to Biological Integrity, Diversity, and Environmental Health**

Biological Integrity, diversity, and environmental health can be simply defined as native fish, wildlife, plants, and their habitats as well as natural processes that support them. As described in this section, the impacts to most fish, wildlife, and plants will be temporary and localized. Mosquito populations which are part of the biological integrity, diversity, and environmental health of the refuge, will be impacted from control actions. However, these impacts will only occur on a maximum of 5 percent of the entire Refuge. Although numbers of mosquitoes will be temporarily and locally reduced, there will likely be no long-term or cumulative effects to mosquitoes on the Refuge.

**Public Review and Comment:** Public review of and comment on this Compatibility Determination was conducted via a 14-day comment period, from March 22 through April 7, 2006, with public notices available at the refuge headquarters and placed at the Ridgefield NWR Complex headquarters; Skamania General Store, North Bonneville City Hall, and post offices at Stevenson and Washougal, Washington. News releases were sent to local newspapers (Vancouver Columbian, Skamania County Pioneer, Camas-Washougal Post Record, and Oregonian). Notification letters that the Compatibility Determination was available at the Franz Lake website were sent to U.S. Fish and Wildlife Service, Lower Columbia River Fisheries Program Office, Western Washington Field Office; National Marine Fisheries Service; Washington Department of Fish and Wildlife (Vancouver); and Washington Trout. Printed copies were sent to Skamania County Mosquito Control Board, Skamania County Commissioners, Federal and State legislators (Brian Baird, Patty Murray, Maria Cantwell); Vancouver Audubon Society; three local non-profit fish organizations; and four local landowners.

Printed copies were also made available at the Stevenson, Washougal, and Vancouver public libraries.

Responses were developed to comments received and a final Compatibility Determination will be made available at the refuge offices, through selected mailings and on the Ridgefield NWR Complex website: <http://fws.gov/ridgefieldrefuges/FLNWRHOME.htm>.

### Summary of Comments Received

A total of 5 response letters were received, with 3 letters in opposition to the initial proposed action (to monitor and control mosquitoes) and 2 letters in support of that action.

Because of the small number of public comments received, they are listed below, along with the Service responses for each. Based on the information included in the draft Compatibility Determination, public comments, and the Service responses to the public comments, the Compatibility Determinations and Justifications as initially proposed remain unchanged.

### Responses to Comments

*Do not use chemicals of any type, as it affects everyone's health through air and water pollution .*

Service Response. We understand your concern for the environment. The proposed action would provide for use of a biodegradable microbial larvicide (*Bacillus thuriensis israeliensis*) for control of mosquitoes. This product is a bacteria which produces endo-toxins that, when ingested by the susceptible insect, causes paralysis of cells in the gut, interfering with normal digestion and feeding. The bacteria are grown on high protein bases (fishmeal, soy flour) which are then formulated into corncob pellets which are broadcast over the treatment area by a backpack sprayer. Therefore, there is no impact to the air. *B.t.i.* remains in the corncob pellets until it becomes ineffective in 7 to 14 days, reducing the possibility of long-term impacts from residual toxicity to the water.

*While the proposed area for treatment may be non-native reed canarygrass and the salmon are not feeding on insects, insects are at the bottom of the food chain and therefore support a myriad of species of vertebrates and invertebrates. Use biological controls such as bats, but do not use a pesticide.*

Service Response. Please see above response. In addition, this compatibility determination was based on research studies that showed that although mosquito larva would be reduced from *B.t.i.* treatments, no impacts occurred to the more than 40 taxa of invertebrates were found at shallow water sites along the Franz Lake shoreline where treatments would occur. Therefore, alternative prey would be available for native fishes, including salmonids, as well as other wildlife species.

During development of the Comprehensive Conservation Plan for the Columbia Gorge Refuges, including Franz Lake Refuge, we investigated the possibility of bat boxes to encourage the presence of bats and subsequent predation on mosquitoes. We learned that the general consensus in the scientific literature is that bats, purple martins, swallows, etc., cannot be

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counted on to provide an effective means of controlling mosquito populations. Success in attracting bats to artificial roosts is highest in areas where bats are already using human-made structures such as barns, old buildings, and bridges. These are not present in the vicinity of Franz Lake. More importantly, many species that use a bat house primarily eat moths and beetles.

*The proposal provides for 4 adult monitoring traps on the refuge. The reader remembered that most of the complaints were from individuals north of Washington State Route 14. Are there monitoring traps set off refuge as well?*

Service Response. The four adult monitoring trap sites to which you refer do not necessarily have traps at them at the same time. The Skamania County Mosquito Board has six traps, which they can place at a variety of places, depending upon localized high levels of mosquito presence. On the refuge, they could put out from 0 to 4 traps. In addition, they have an additional 20 off-refuge sites where they could place the traps. In past years these have included such places as Franz and Duncan Creek Roads, Skamania Landing, Archer Mountain, and the North Bonneville golf course. The purpose of these traps, as described in the proposal, is to determine relative numbers and species presence, and but to collect samples to send to the Olympia office of the Washington Department of Health to obtain species identification and test for diseases such as West Nile Virus. The clarification about the traps to be placed on the refuge has been made in this compatibility determination.

*Is there any way of telling if the mosquitoes causing the complaints are really coming from Franz Lake?*

Service Response. During the years prior to the development of the compatibility determination for mosquito control, monitoring, and research in 2002, the Service proposed a study of the movement of *Aedes* mosquitoes between Franz Lake NWR and the local residences of Skamania. Although we felt this study was important, after further discussions with Jill Townzen, Multnomah County Mosquito Vector Agency entomologist, an additional literature review, and a close examination of priorities relative to federal resources, the Service biological staff from the refuge and the Regional Office determined that the project would have to be more extensive and much more expensive than originally planned, in order to obtain sufficient mosquito recaptures to obtain meaningful results. The research studies described in the current proposal were affordable, and it was felt the results would provide meaningful information upon which to base this compatibility determination.

*When this issue first was discussed, it was mentioned that mosquitoes rarely go very far from where they are hatched. In addition, the reader described their belief that the mosquitoes would be torn apart in the strong winds in the Columbia River Gorge.*

Service Response. Additional information learned since then from the U.S. Fish and Wildlife Regional Biological Office, Oregon Department of Human Services, and Multnomah County Vector Control Agency, indicate that the while some mosquitoes have a short flight range, *Aedes vexans*, one of the primary mosquitoes of concern, has as flight range of 5 to 10 miles. There is



no known evidence regarding their being torn apart in the strong winds in the Columbia River Gorge.

*The reader feels the Skamania County Mosquito Control Board should be conducting public education programs to teach people about simple, non-lethal forms of mosquito control that they all can undertake in their own back yard.*

Service Response. We agree, and the Refuge staff has attended informational workshops hosted by the Oregon Department of Human Services in Portland where such information has been obtained. We have informed the Skamania County Mosquito Control Board of the workshops, and have shared information gathered with the Board. It is up them, however, to disseminate that information to the residents of their district. We have seen several articles in the in the Skamania Pioneer Press about the possibility of mosquitoes in the local area and the potential dangers of West Nile Virus, and the actions the individual can take to reduce the numbers of mosquitoes around their house and number of mosquito bites they receive.

*The reader indicated that the refuge staff did not express a concern for wildlife. Did they obtain food and water from Franz Lake, and what are the possible effects of B.t.i. on those users? What about birds, swans, deer, coyote, raccoon, and mink?*

Service Response. As indicated in the compatibility determination, *B.t.i.* is selective to mosquitoes. The research carried out and described in the proposal confirms that there were no impacts to other non-target invertebrates. As such, the researchers found no impacts to the invertebrate communities upon which small birds might feed. Swans using Franz Lake feed on wapato tubers on the bottom of the lake, not the invertebrate resources targeted along the shallow areas of the east and south shorelines. Toxicological information indicates that *B.t.i.* was found to be only mildly toxic to rats when fed in large doses, so it would not be anticipated to present a danger to other mammals.

*The reader made reference to a study described in the proposal in which 179 general of aquatic insects were examined, with chironomids (primarily midges) representing about half of the insect genera present at the beginning of the study, and only 1 – 6 general in the treatment sites at the end of the study. She was concerned that even though we believed the study did not apply, she was concerned with the severity of the negative impacts and the potential for damaging the ecosystem in which it occurred.*

Service Response. Comment noted. As we noted in the proposed compatibility determination, the above study was done in Minnesota in a closed wetland system. The entire wetland was treated, and over three consecutive years. In comparison, the area of proposed treatment is a very small portion of Franz Lake (a maximum of 3-5 percent depending on normal Columbia River water levels or high flood levels) which would be treated at any one time. In addition, the Franz Lake system is open to the Columbia River and the adjacent Arthur Lake, with the opportunity for recharging the Franz Lake wetlands with invertebrates during seasonal water elevation fluctuations. Based on our professional biological judgment, we believe these conditions are valid and applicable.

*The reader makes reference to “likely” and “unlikely” being used in the proposal, specifically in reference to the availability of alternative prey “likely” to be available after B.t.i. treatment for native fishes as a food source.*

Service Response. Comment noted. As in any ecological system, we cannot be positive that after the *B.t.i.* treatment is applied, that alternative prey would be available. We use the phrase “likely” because based on the research that was completed at Franz Lake, the invertebrate population other than the mosquito larvae were not negatively impacted during the time of the study, and led us to believe that based on our professional biological knowledge, alternative invertebrate food resources other than mosquito larvae would be available to native fish (including salmonids).

*The proposal states that localized and temporary impacts of the mosquito monitoring and treatments will not likely conflict with any wildlife dependent public uses in the future. What are wildlife dependent public uses?*

Service Response. Franz Lake NWR is currently closed to public use due to two factors – its small size and the fact that the only access is via an easement on a privately owned road, which restricts refuge use to administrative and management purposes. Therefore, the proposed mosquito management activities will not conflict with any current wildlife dependent uses.

As described in the Comprehensive Conservation Plan recently completed, if existing privately-owned inholdings were acquired in the future, opportunities could be explored to establish wildlife dependent uses closer to Franz Lake on existing cleared agricultural and developed tracts. These might include wildlife observation, photography, and environmental education and interpretation. Again, because of the fact that the *B.t.i.* application is done in shallow water where mosquito larvae are found, these upland recreational uses would not be impacted.

Wildlife dependent uses are such uses as hunting, fishing, wildlife observation, photography, interpretation and environmental education. This information will be added to the final compatibility determination.

*The reader makes reference to the fact that 97.20% of the ingredients (inert) used in the formulation of the larvicide to be used, Vectobac-G, are unknown, and that there should be ecological considerations because of that fact.*

Service Response. Inert ingredients are typically carriers for the active ingredient, in this case that is *Bacillus thuringiensis israelensis*. Valent Biosciences, manufacturer of the products, has indicated that the inert ingredients include corn cob pellets, a sticker, cooking oil, and other nonreactive ingredients incorporated into product to allow for dispersal.

#### **Determination for Monitoring and Treatment of Mosquitoes for Control**

\_\_\_\_ Use is Not Compatible

X   Use is Compatible with Following Stipulations

**Stipulations for Mosquito Monitoring and Treatment:**

1. A Special Use Permit for each mosquito season (April 1 – September 30) must be obtained from the Refuge Manager by the Skamania County Mosquito Control Board (Control Board) that proposes to carry out these activities on the Franz Lake Refuge with the starting and ending dates of monitoring and treatment season stipulated in the permit.
2. Control Board employees will conduct mosquito monitoring and treatment activities. Service personnel will accompany mosquito control district personnel as determined by the Refuge Manager, who will monitor compliance with these stipulations and the terms and conditions specified in the Special Use Permit.
3. Monitoring and subsequent treatment activities under this determination are permitted only in the wetland areas identified in Figures 2 and 3. This figure includes the following areas:
  - a. An area approximately 10 acres of canarygrass between the open water area of Franz Lake and the Franz Lake dike (Figure 2)
  - b. A narrow 10 foot-20 foot band of shallowly flooded vegetation long the south shoreline of the lake, just below an approximate 4 foot high bench south of the shoreline (Figure 2).
  - c. In the event of water levels are above the 4 foot high bench (20 foot MSL river levels) described in Item b., mosquito board employees will only treat the 10 foot-20 foot leading edges of the flooded lake edge. In addition, when river water levels are from 20 foot to 30 foot MSL, there is an approximately 1-foot deep, 15-acre elongated depression which would be flooded and could also be monitored and treated for mosquitoes (Figure 3).
4. Mosquito control board employees will conduct monitoring/treatment activities primarily by foot. One all-terrain vehicle at slow speeds, not to exceed 5 miles per hour, may be used along the south shoreline to access the lakeshore to minimize the duration and number of additional trips to complete these activities.
5. The only mosquito control agent authorized for use is *B.t.i. (Bacillus thuringiensis var. israeliensis)*. In accordance with the Federal Insecticide, Fungicide and Rodenticide Act, the Mosquito Board employees must follow label directions. The Control Board currently uses Vectobac-G. Any plans to use another product of the same agent must be approved by the Refuge Manager prior to use. Treatment of mosquitoes may occur only at sites where dip sampling reaches or exceeds five mosquito larvae per dip (treatment threshold).

6. Control Board employees may only treat the same area a maximum of three times during a mosquito season. Additional treatments in areas previously treated three times will require authorization from the Refuge Manager. Information on areas treated will be collected on a daily basis utilizing a GPS unit as identified in Stipulation 9. These data must be readily accessible to the Refuge Manager, as needed, to verify the total number and location of each application.
7. Control Board staff will notify the Refuge Manager at least two days before requiring refuge access, and indicate the days planned for monitoring or treatment. Identification of the vehicles to be used by the permittee needs to be documented prior to each mosquito season or during the above-mentioned contact.

Control Board staff is required to contact the Refuge staff in the order listed below to obtain approval for mosquito control before applying *B.t.i.* If refuge staff is not available, a voice mail message must be left at the phone numbers listed below. If Refuge staff does not respond within 24 hours, *B.t.i.* may be applied without Refuge approval. Notify Refuge staff of application as soon as it is possible after it is completed.

Primary contact: Jim Clapp, Refuge Manager (360) 835-8767

If not available, contact in the following order at: (360) 887-4106  
Joe Engler, Refuge Biologist  
Tim Bodeen, Project Leader

8. Control Board employees are responsible for daily removal of all equipment and refuse resulting from his/her monitoring and treatment activities on Refuge lands. Control Board staff will be responsible for repairing all damage to government property resulting from these operations.

9. Throughout the mosquito season, Control Board staff will maintain current records of the following information for each monitoring and treatment trip on the Refuge: date, locations and size of areas (geo-referenced with GPS), average number of larvae per dip along with species (if a sample is taken back and hatched), *B.t.i.* application rate, and post-treatment monitoring results. All monitoring/treatment events will be grouped for each site, and listed chronologically. This information will be used in developing the end of the year report described in Stipulation 10. This data must be readily available (48 hours) upon request of the Refuge Manager.
10. Control Board staff is required to submit a report of all monitoring and treatment activities as described under Stipulation 9, by November 30 of each year, following a format provided by Refuge staff.

**Failure to abide by these stipulations may result in suspending or non-renewal of SUPs.**

**Justification for Mosquito Monitoring and Control:**

For the following reasons, mosquito monitoring and *B.t.i.* treatments for control of mosquitoes on the Refuge will not materially interfere with or detract from fulfilling the NWRS mission or achieving Refuge purposes:

- Under the worse case scenario with high Columbia River levels, a maximum of 5 percent of the total refuge acreage would be impacted by mosquito monitoring and treatment activities annually from April 1 through September 30.
- Results of the invertebrate *B.t.i.* study conducted on the refuge during 2003, indicate that no impacts to non-target invertebrates were associated with three *B.t.i.* treatments for control of mosquito larva on the shallowly flooded south shoreline of Franz Lake.
- Results of fish community monitoring conducted on the Refuge over a three-year period found that salmonids generally did not utilize shallowly flooded habitats throughout the mosquito season.
- Limited fish diet analyses for Franz Lake indicated that salmonids did not forage extensively on mosquito larvae
- Although mosquito larva will be reduced from *B.t.i.* treatments, over 40 taxa of invertebrates with 50 percent of the taxa represented by other insects were found at shallow water sites were treatments would occur after treatment. Therefore, alternative prey is likely available for native fishes, including salmonids, as well as other wildlife species.
- Monitoring and treatment activities will likely result in only temporary and localized disturbance to fish and wildlife.
- Although there are currently no permitted public uses on the refuge, it is likely that the localized and temporary impacts of the mosquito monitoring and treatments identified will likely not conflict with any wildlife dependent public uses in the future. Wildlife dependent uses include hunting, fishing, wildlife observation, wildlife photography, environmental

education and interpretation.

**Determination for Adult Monitoring for Disease Presence**

\_\_\_\_ Use is Not Compatible X Use is Compatible with Following Stipulations

**Stipulations for Adult Monitoring for Disease Presence:**

1. A Special Use Permit for each mosquito season (April 1 – September 30) must be obtained from the Refuge Manager by the Skamania County Mosquito Control Board (Control Board) that proposes to carry out these activities on the Refuge. This permit may be issued in conjunction with a permit for mosquito monitoring and treatment west of the Franz Lake dike.
2. The mosquito control board employees will conduct mosquito monitoring activities.
3. Monitoring activities are permitted only in the areas identified in Figure 4 unless authorized by the Refuge Manager.
4. Control Board employees may use truck or all-terrain vehicles to get close to the adult trap sites with foot traffic permitted as needed. The vehicles are restricted to Service roads and trails used in conjunction with monitoring and treatment for mosquito control activities, following all stipulations contained therein. Vehicles are to be driven at slow speeds, not to exceed 5 miles per hour.
5. Permittee is responsible for removal of all unnecessary monitoring equipment and refuse resulting from his/her daily operations on refuge lands throughout the mosquito season. All equipment will be removed from the refuge by September 30. Permittee will be responsible for repairing all damage to government property resulting from these operations.
6. Permittee shall keep a record of all trap visits and monitor results of mosquito identification as they are received from the Washington Department of Health office in Olympia, Washington. A report with that information will be provided to the refuge staff along with the monitoring and treatment report, due November 30 of each year.

**Failure to abide by these stipulations may result in suspending or non-renewal of SUPs.**

**Justification for Adult Monitoring for Disease Presence:**

This justification applies to installing and monitoring adult mosquito traps in the vicinity of Franz Lake. Setting up and monitoring these traps will be conducted at approximately the same time as monitoring and treating the Franz Lake shorelines, also described in this CD. For this reason, there would be no additional impacts on refuge wildlife or habitat resources as this activity was conducted as described in the **Justification for Mosquito Monitoring and Control** Section.

**Mandatory Re-Evaluation Date** (provide month and year for “allowed” uses only):

\_\_\_\_\_ Mandatory 15-year Re-Evaluation Date (for priority public uses)

July 2016 Mandatory 10-year Re-Evaluation Date (for all uses other than priority public uses)

**NEPA Compliance for Refuge Use Decision:**

\_\_\_ Categorical Exclusion without Environmental Action Statement

X Categorical Exclusion and Environmental Action Statement (Appendix 1)

\_\_\_ Environmental Assessment and Finding of No Significant Impact

\_\_\_ Environmental Impact Statement and Record of Decision

**References Cited:**

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## **Refuge Determination**

Prepared by:



Refuge Manager: \_\_\_\_\_  
(Signature) (Date)

Approval:

Project Leader \_\_\_\_\_  
(Signature) (Date)

Concurrence:

Refuge Supervisor: \_\_\_\_\_  
(Signature) (Date)

Regional Chief,  
National Wildlife  
Refuge System:

\_\_\_\_\_  
(Signature) (Date)

Figure 1. Franz Lake National Wildlife Refuge.

Figure 2. Mosquito Monitoring and Treatment Areas (Columbia River Water Levels below 20' MSL).

Figure 3. Mosquito Monitoring and Treatment Areas (Columbia River Water Levels above 20' MSL).

Figure 4. Locations for Placement of Adult Monitoring Maps

**U. S. FISH AND WILDLIFE SERVICE**

**ENVIRONMENTAL ACTION STATEMENT FOR CATEGORICAL EXCLUSION**

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA), and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record and determined that the following proposed action is categorically excluded from NEPA documentation requirements consistent with 40 CFR 1508.4, 516 DM 2.3A, 516 DM 2 Appendix 1, and 516 DM 6 Appendix 1.4.

Proposed Action.

The proposed action is to issue a Special Use Permit to the Skamania County Mosquito Control Board to conduct mosquito monitoring and treatment on the Franz Lake National Wildlife Refuge. Treatment will be conducted using the biological control *Bacillus thuringiensis israelensis* west of the Franz Lake dike.

Categorical Exclusion(s).

516 DM 6, Appendix 1.4 A(1). Changes or amendments to an approved action when such changes have no or minor potential environmental impact.

516 DM 6, Appendix 1.4 B(7). Minor changes in the amounts or types of public use on Service or State-managed lands, in accordance with existing regulations, management plans, and procedures.

516 DM 6, Appendix 1.4 B(9). Minor changes in existing...operations, when no or minor effects are anticipated. Examples could include minor changes in the type and location of compatible public use activities and land management practices.

The proposed action does not trigger an Exception to the Categorical Exclusions, 516 DM 2, Appendix 2.

Permits/Approvals.

The only permit involved for the proposed action is the refuge-issued Special Use Permit to be issued to the Skamania Mosquito Control Board.

Public Involvement/Interagency Coordination.

Public review of and comment on the draft Compatibility Determination was conducted via a 15-day comment period from March 23 through April 7, 2006, with notices placed at or mailed to the

following U.S. Fish and Wildlife Service offices: Ridgefield NWR Complex headquarters, Lower Columbia River Fisheries Program Office, Washington State Office. It was also sent to the National Marine Fisheries Service; Washington Department of Fish and Wildlife (Vancouver); Skamania County District 1 Commissioner; mosquito control districts (Skamania County, Clark County, Multnomah County); Stevenson and Camas post offices and libraries; the Skamania General Store; and in local newspapers (Vancouver Columbian, Skamania County Pioneer, Camas-Washougal Post Record, and Oregonian). Copies were sent to federal and state local legislative representatives.

A total of 5 response letters were received with three responses in opposition to the proposed action that mosquito monitoring and control be allowed and two responses in support of that action. These comments and Service responses are included in the final Compatibility Determination for Mosquito Monitoring and Control.

Supporting Documents. Supporting documents for this determination include relevant office file material and the following key reference:

Final Compatibility Determination for Mosquito Monitoring and Control on the Franz Lake National Wildlife Refuge. April 2006.

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(Project Leader)

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(Date)